

Skeletal Suspension and Traction in the Treatment of Burns

D. L. LARSON, M.D., E. B. EVANS, M.D., S. ABSTON, M.D.,
S. R. LEWIS, M.D.

From the Shriners Burns Institute, Division of Plastic, Orthopedic, and General Surgery, The University of Texas Medical Branch, Galveston, Texas

SKIN GRAFTS applied to burned patients may frequently be lost, especially in children. Common causes for this loss may be: (1) the formation of hematomas, seromas, or pustules under the grafts, and (2) the dislodgement of grafts during dressing changes or from movement of the patient. We have found the technic of exposing grafts (no dressings) to be consistently associated with successful graft "take," as the exposed grafts adhere quickly, have no dressings to disturb them, and any fluid formation under the grafts can be easily removed. A useful adjunct to exposing these grafts has been the development of skeletal suspension.

Skeletal Suspension

More than 350 Steinmann pins have been inserted in various bones for the purpose of skeletal suspension and found to be a secure and relatively painless method with no associated major complications.

Neck

Immobilization of the neck is often very difficult to achieve and loss of graft is commonly associated with severe contractural deformities. Two methods to immobilize this area in maximum extension have been tried. The first consists of attaching Barton Tongs to the temporal bones (Fig. 1) and

the second consists of placing a Steinmann pin through the anterior-inferior portion of the mandible (Fig. 2). This pin is removed near the tenth postoperative day, and a neck splint applied which is worn constantly for 3 months and nightly for an additional 3 months. Weights are attached in both methods for skeletal traction. Although both methods have been successful, the latter appears to be relatively simple and more effective.

Upper Extremities

Skeletal suspension in the upper extremities has been accomplished by placing a Steinmann pin through the distal radius approximately two inches proximal to the wrist joint (Fig. 3). The pin is inserted



FIG. 1. Barton tongs utilized to maintain extension of the neck after grafting.

Submitted for publication April 1, 1968.

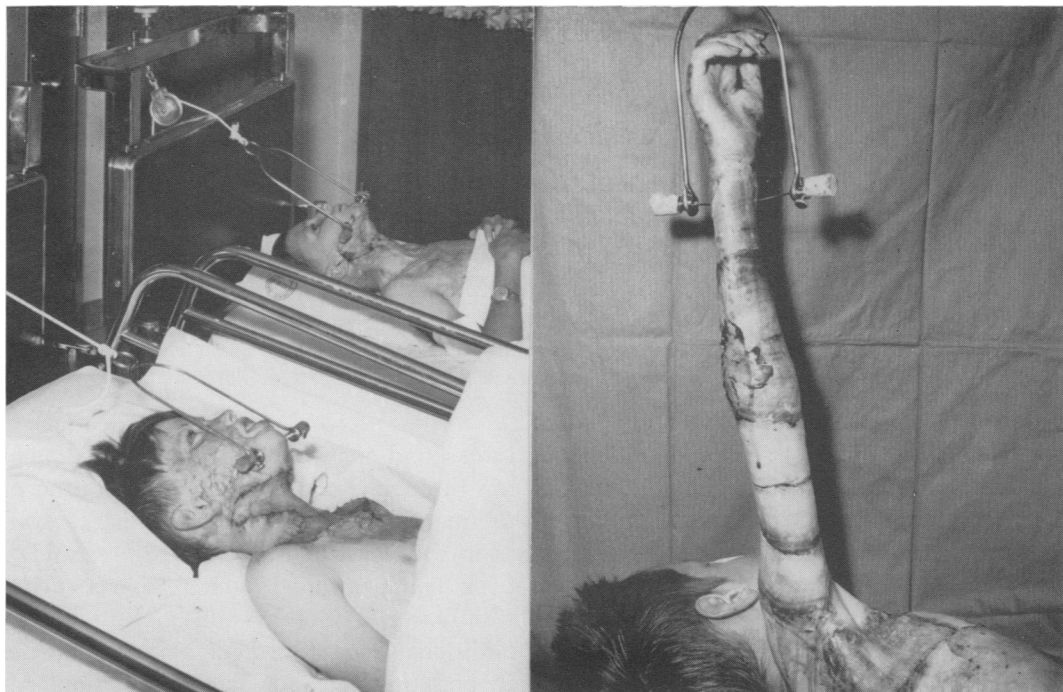


FIG. 2 (left). Threaded pin inserted into mandible for immobilization and extension of the neck after grafting. FIG. 3 (right). Threaded pin inserted through distal radius for skeletal suspension of the upper extremity.

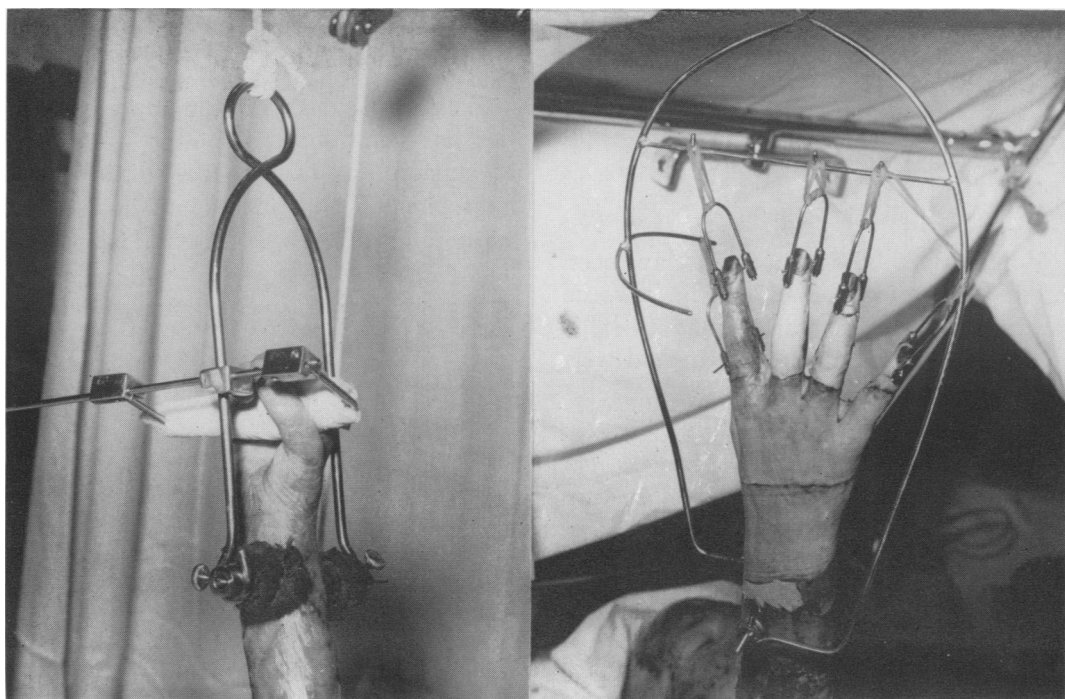


FIG. 4 (left). Attached bow maintains hand and wrist in good position. FIG. 5 (right). Threaded Steinmann pin in the radius and Kirschner wires in the distal phalanges maintain finger and wrist extension following grafting.

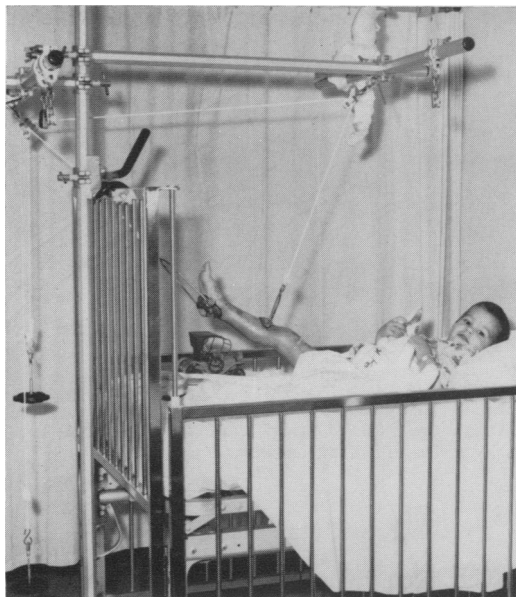


FIG. 6. Threaded Steinmann pins in the proximal tibia and calcaneus suspend the lower extremity after grafting.

through the dorsum of the wrist to avoid impaling the radial artery between the pin and the bone. Threaded pins are utilized to avoid slippage of the extremity on the pin. A large bow is attached to the pin for suspension of the extremity, and a specially designed hand splint added to hold the hand and wrist in an acceptable position (Fig. 4). Ten days following the application of skin grafts, the pins are removed and extensor braces applied and worn for 6 months, except during physiotherapy.

Hands

Possibly one of the most difficult areas to obtain excellent skin graft "take" is the burned hand, because of the difficulty in applying a dressing which will prevent dislodgement of the grafts. A simple, but very effective, method of utilizing a circular splint attached to the radius and phalanges has consistently given excellent graft "take." A Steinmann pin is inserted through the distal radius as previously described, and the extremity suspended by the circular splint. Kirschner wires are then inserted

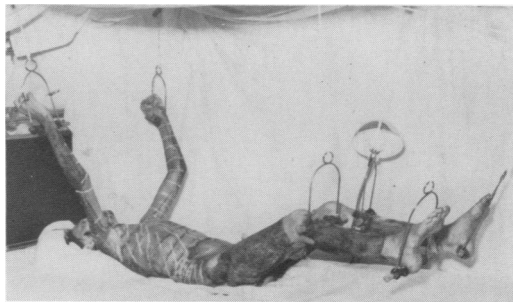


FIG. 7. Skeletal suspension allows exposure of skin grafts and donor sites.

through the distal phalanges and attached by rubber bands to the circular frame (Fig. 5). By this technic, skin grafts are easily applied to the fingers and hand without the use of sutures. Again, the pins are removed approximately 10 days following operation and physiotherapy begun. If the extensor slip has been destroyed, a hand splint is worn to keep the proximal interphalangeal joints in extension until the extensor hood can be repaired.

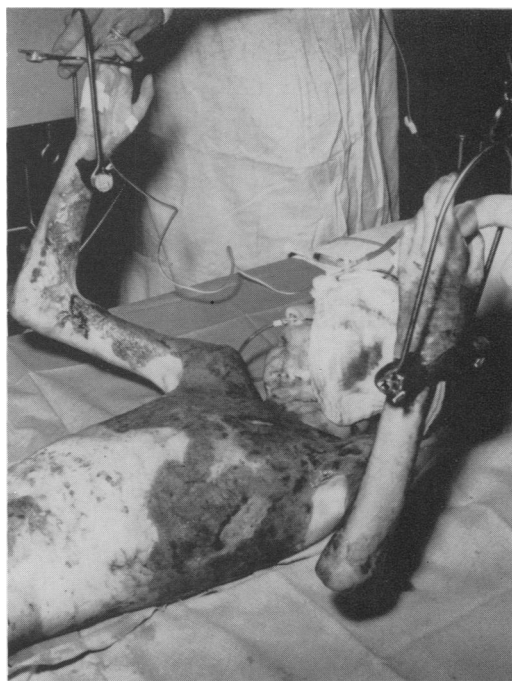


FIG. 8. Skeletal traction applied, at the time of grafting, to upper extremities with severe flexion contractures.

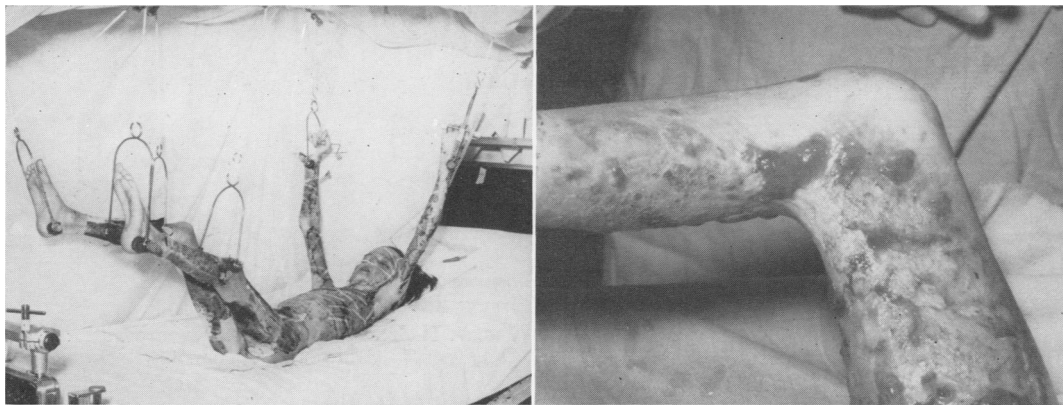


FIG. 9 (left). Elbows straight with 8 days of skeletal traction. FIG. 10 (right). Lower extremity with severe flexion contracture and hypertrophic granulations.

Lower Extremities

The lower extremity is suspended by inserting a threaded Steinmann pin through the proximal portion of the tibia and the calcaneus (Fig. 6). By suspending the extremities in this fashion, the surgeon can apply the skin grafts without requiring an assistant to elevate the legs. Postoperatively, this skeletal suspension allows not only exposure of the skin grafts but the donor sites as well (Fig. 7). When the grafts have "taken" and the pins removed, extensor splints are applied to prevent the development of flexion contractures of the knee.

Skeletal Traction

The technic for skeletal traction is no different than that of skeletal suspension except for the possible use of added weights postoperatively. Contractures of granulating burned extremities have been easily corrected by this technic. What a pleasant sight it is to observe the severe contractures gradually straighten within 3 to 7 days following operation, while at the same time, the skin grafts are taking (Figs. 8, 9).

Skeletal traction has been used successfully to lengthen deeper structures, when release of the scar band has not resulted in

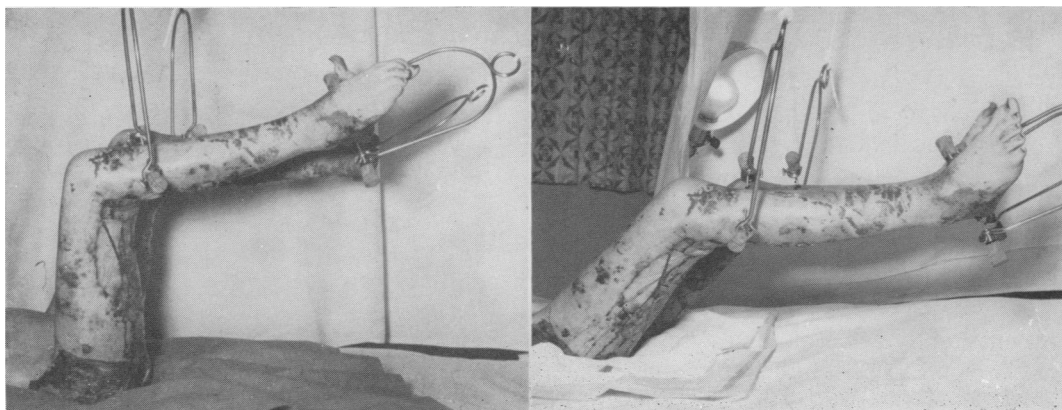


FIG. 11 (left). Surgical incision through scar band results in an insufficient release. FIG. 12 (right) Twenty-four hours of skeletal traction following surgical release and grafting.

correction of the flexion deformity. The skin graft is loosely applied to the surgical defect and skeletal traction applied (Figs. 10, 11, 12, 13).

Complications

All complications observed from the utilization of skeletal suspension and traction have been correctable. The most distressing of these is cerebral edema which can accompany severe elevation of the lower extremities with the head at a lower level than the heart. This is prevented by always maintaining the head at a level above the heart.

Another complication may be the formation of local cellulitis about the pin sites. This will be infrequent if threaded pins are utilized, pin sites kept clean, and the pin is placed securely in bone rather than soft tissue. If local cellulitis does occur, it is usually not severe and is treated by simply removing the pins, applying moist dressings and administering antibiotic drugs. No case of bone infection has been seen

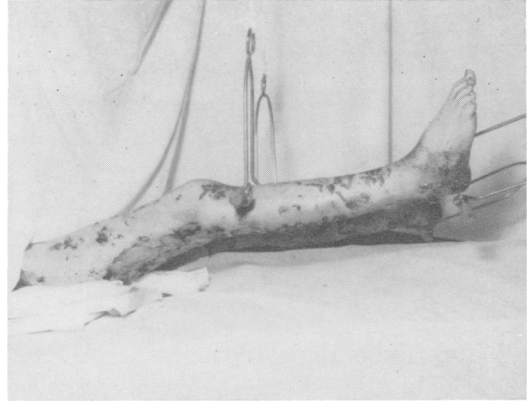


FIG. 13. Contracture corrected with 6 days of skeletal traction.

even though pins are often placed through granulations.

Summary

More than 350 Steinmann pins have been utilized successfully in burned patients for skeletal suspension and traction to allow exposure of skin grafts and correct contractures without a major complication resulting.